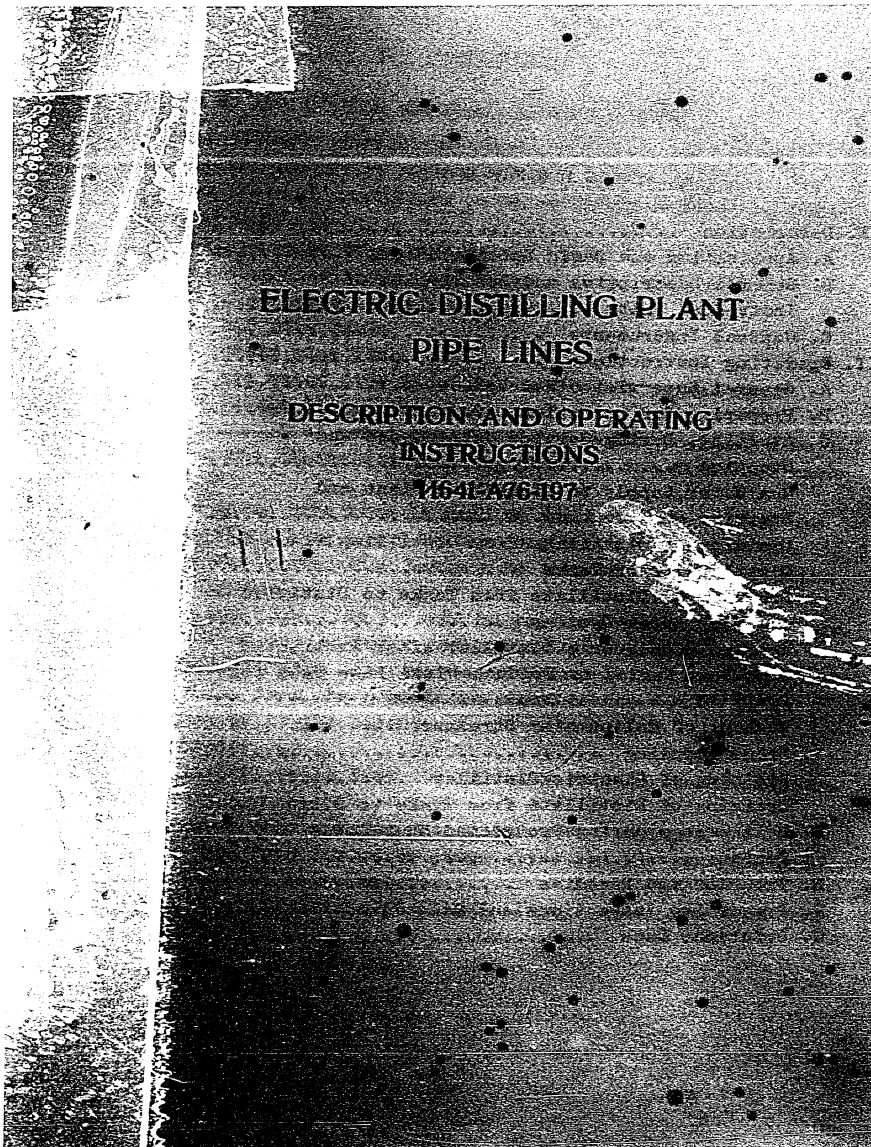


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I. DESCRIPTION

A. APPLICATION AND BASIC SPECIFICATIONS

The electric distilling plant pipe lines are intended for ensuring the operation of the electric distiller.

The electric distilling plant is equipped with the following pipe lines:

- (a) sea water pipe line;
- (b) distilled water pipe line;
- (c) steam pipe line;
- (d) air pipe line;
- (e) drain pipe line.

The sea water pipe line serves for feeding sea water directly to the distilling plant.

The distilled water pipe line serves for draining distillate from the electric distilling plant to the distilled water tanks.

The steam pipe line is used to discharge steam from the electric distilling plant by the compressor or to pass the steam to the evaporating battery in case the compressor turns to be defective.

The air pipe line is used to supply intermediate pressure air to the distilled water tanks for draining them.

The drain pipe line serves to drain:

- water from the distilling plant to the contaminated water tank or to the bilge;
- brine;
- distillate in case its salinity exceeds the permissible value;
- water when washing the salinometer strainer;
- water from the water gauge glass and the compound pressure-and-vacuum gauge valves.

The Specifications of the above pipe lines are tabulated below in Table 1.

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Table 1.

Nos	Pipe lines	Passage area	Materials of		Notes
			pipes	fittings	
1	Sea water pipe line	14 x 1.5 6 x 1.5	Copper	Bronze	
2	Air pipe line	14 x 1.5 6 x 1.5 14 x 1.5	Cooper Stainless steel	Brass, bronze	
3	Drain pipe line	24 x 2 14 x 1.5 9 x 1.5 6 x 1.5	Copper	Bronze	
4	Steam pipe line	57 x 2 32 x 2 9 x 1.5	Stainless steel	Brass	
5	Distilled water pipe line	32 x 2 25 x 1.5 14 x 1.5	Stainless steel	Brass, stainless steel	

Below are given the data on the test pressure for the pipe lines

Table 2

Nos	Pipe lines	Tightness test pressure, kgf/cm ²	Notes
1	<u>Sea water pipe line</u> (a) pipes from shaft line cooling pipes and from valve 27 to pressure reducing valve 11 (b) pipes from pressure valve 11 to valves 7 and 8	38.0 3.0	Tested under hydraulic pressure Tested under hydraulic pressure

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Nos	Pipe lines	Tightness test pres- sure, 2 kgf/cm ²	Notes
2	<u>Steam pipe line</u> (a) from the electric distiller branch pipe to evaporating battery and compound pressure and vacuum gauges 31	0.5	Tested under air pressure together with distilling plant
3	<u>Distilled water pipe line</u> (a) from valve 3 to valves 15, 18, 19, 20 and cock 21 (b) from valve 18 to water mains	1.0	Tested under hyd- raulic pressure
	<u>Water line</u> (a) from inter- mediate pressure air pipe to cock 25	12.5	Tested under hyd- raulic pressure together with fresh water mains
	<u>Water line</u> (b) from inter- mediate pressure air pipe to cock 25	35.0	Tested under air pressure together with intermediate pressure air pipe line
	from valve 25 to valves 17 and	1.0	Tested under air pressure
	from cocks 2, 3, 4, 5 and from safety	By flood test	
	from valves 1 to contaminated water tank	0.3	Tested under hyd- raulic pressure together with con- taminated water tank

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B. GENERAL DESCRIPTION AND DESCRIPTION OF INDIVIDUAL UNITS

(See Appendix 1)

Sea water is fed to the electric distiller, as a rule, from the shaft line cooling pump. In case the latter is not in operation, sea water can be also fed from the sea water pipe line of the ship's arrangement respectively through valves 26 or 27 and strainer 28 to prevent the pipes from clogging.

To reduce the pressure of sea water, pressure-reducing valve 11 is mounted on the sea water pipe line. The valve is adjusted for a pressure of $P_{\text{working}} = 2.0 \text{ kgf/cm}^2$.

Pressure gauge 29 with the red line against 2.5 kgf/cm^2 is installed to check the pressure behind the reducing valve.

Water to the electric distiller is fed through the automatic feed regulator or through valve 8 in the event of derangement of the feed regulator.

For collecting the distillate, two distilled water tanks are installed. The tanks are equipped with vent valves 20.

The tanks are filled in turn by setting cock 16 to the respective position.

Distilled water from the tanks is transferred to the distiller or to the fresh water systems with the aid of the vacuum pump which is fed from the intermediate pressure air line through throttle valve 25, air strainer 23 and air filter 24.

To check the pressure in the distilled water tanks, the pressure gauge 24 with the red line is installed.

The pressure in the tanks is adjusted for a pressure of $P_{\text{working}} = 2.0 \text{ kgf/cm}^2$ by means of the three-way cock 21 lest the pressure should exceed the safe working pressure.

The tanks are filled in turn by setting cock 16 to the respective position.

In case of repair or replacement of the tanks, the pressure in the tanks should be checked.

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Salinity of the distillate is determined with the aid of millivoltmeter salinometer 32.

Salinometer pick-up 13 is mounted on the pipes feeding the distillate to the distilled water tanks.

Strainer 10 of the salinometer is arranged before its pick-up. In case the strainer gets clogged, it may be cleaned by reversing the flow of water which is achieved by shifting three-way cocks 9 and 12 to the respective positions.

When strainer 10 is being washed, the distillate is drained through three-way cock 9 into the bilge (See the Salinometer Operating Instructions).

Salinity of the distillate shall not exceed 5 mg/lit. In case salinity of the distillate exceeds this value, the distillate shall be drained to the bilge through three-way cock 14. This also shall be done after protracted shut-down period of the distilling plant, when the distillate is to be used as drinking water.

After the required salinity has been obtained and the distillate line has been properly washed, the distillate may be collected in the distilled water tanks.

Brine is drained from the electric distiller to the contaminated water tank through valve 5 and three-way cock 6. A sample of brine for testing is taken from the cock 6 drain pipe.

Water from the electric distiller is drained to the contaminated water tank through valve 1.

Steam from the upper portion of the electric distiller is fed to the evaporating battery with the help of the electric compressor. In case of derangement of the electric compressor, the steam under the action of the excessive pressure in the distiller will be fed past the electric compressor through non-return shut-off valve 33.

Compound pressure-and-vacuum gauges 31 are provided to check the pressure of the steam both before and after the electric compressor. The compound gauges are blown off through valves 30.

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Air Strainer

(See Appendix 2)

This is installed on the air pipe line and is intended for purification of the air from moisture and oil vapours.

The strainer consists of steel welded housing 45 with detachable cover 44. The interior of the strainer is divided with meshes 43 into three sections which house the filtering elements: activated charcoal 42 in the centre section, and cotton wool 41 in the extreme ones.

Sea Water Strum

(See Appendix 3)

This is meant to protect the pipe lines from clogging.

The strum consists of housing 51 which houses filtering element 54 manufactured from brass mesh.

In the bottom of the strum there is drain plug 50 to remove water during cleaning and repair.

To remove the filtering element from the housing, special plug 53 is provided.

Packing of the plug and the housing is effected through paronite gasket 52.

C. CONTROL INSTRUMENTS

Ref.Nos in schematic diagram	Name and ap- plication of instrument	Type	Rated Value	Location
			Limit value	
29	Pressure gauge to check pres- sure of sea water fed to distil- ler after reducing valve	Spring-type with pointer; scale gradua- ted from 0 to 4 kgf/cm ² , accuracy grade 2.5	1-2.5 kgf/cm ² 2.5 kgf/cm ²	No. 6 com- partment distiller to sea wa- ter pipe line

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Ref.Nos in schematic diagram	Name and ap- plication of instrument	Type	Rated value Limit value	Location
24	Pressure gauge to check pres- sure of air fed to dis- tilled water tanks	Spring-type with poin- ter; scale graduated from 0 to 1.6 kgf/cm ² , accuracy grade 2.5	0.5-1 kgf/cm ² 1 kgf/cm ²	No.6 com- partment near distil- led water tanks, on air pipe line

II. OPERATING INSTRUCTIONS

These Instructions deal only with the pipe lines of the electric distilling plant.

For preparing, starting, during-service maintenance and stopping of the electric distilling plant as well as for elimination of troubles, see the "D.C. Electric Distilling Plant, Capacity 25 to 45 Lit/Hr. Description and Operating Instructions".

A. GENERAL SUPERVISION AND UPKEEP

1. See to it that the distilled water tanks, as well as all the joints on the pipe lines and fittings are perfectly tight.
2. Timely drain the distilled water tanks as they have been filled with the distillate to the distilled water or to the fresh water systems depending on the need.

B. PREPARING FOR OPERATION

Initial Position

3. The valves on all the pipe lines are shut down, the distilled water tanks are drained, three-way cock 6 is in the position to drain the brine to the contaminated water tank, three-way cock 9 is in the position to drain the distillate to the bilge, three-way cock 12 is in the position to feed the

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distillate only from strainer 11 to sea water pick-up 13, three-way cock 14 is in the position to drain the distillate to the bilge, three-way cocks 16, 17 and 18 are in the position to communicate with one of the distilled water tanks.

Prior to starting the electric distilling plant, do the following:

4. Crack valve 26 or 27 and make sure that the sea water is present in the shaft line cooling pipe or in the sea water pipe line of the WC's arrangement of No.6 compartment as read off pressure gauge 29.

In case no water is present in the above pipe line, feed sea water to these pipe lines in accordance with the Instructions for cooling the shaft line or for maintenance of the WC's arrangement.

5. By slowly cracking throttle valve 25 check the pressure in the intermediate pressure air pipe line by pressure gauge 24.

If the pressure gauge reads no pressure, perform the procedures dealing with feeding the air in accordance with the Maintenance Instructions for the intermediate pressure air pipe line.

6. Having cracked vent valves 20 and drain valves 15, make sure that the distilled water tanks contain no water, otherwise drain it to the bilge.

7. Make sure that the contaminated water tank contains no water. Use the sounding rod of the tank for the purpose otherwise drain the tank in accordance with the Instructions for the drain system.

8. Prepare the electric distiller for operation proceeding in accordance with the Maintenance Instructions for the distilling plant.

9. STARTING, DURING-SERVICE MAINTENANCE AND STOPPING

Sea Water Supply to Distilling Plant and Starting

9. Open valve 26 or 27 and make sure that the pressure of the sea water after reducing valve 11 does not exceed 2.5 kgf/cm^2 as read off pressure gauge 29.

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10. Set three-way cock 9 to the position to feed distillate through strainer 10.

11. Fill the electric distiller with sea water. Put the plant into operation in accordance with the Instructions for operating the distilling plant.

12. Check the distillate for salinity by the millivoltmeter salinometer. Salinity of the distillate shall not exceed 5 mg/lit.

Drainage of Distillate from Distilling Plant to Distilled Water Tanks

13. Set three-way cock 14 to the position to feed the distillate to the distilled water tanks.

14. Set three-way cock 16 to the position to feed the distillate to one of the distilled water tanks.

15. Set three-way cock 17 to the position to cut off the distilled water tank.

16. Open valve 20 on the distilled water tank to be filled up and start filling it.

After water escapes from valve 20, do the following:

17. Open valve 20 on the tank which is not filled with water.

18. Shift three-way cock 16 to the position to feed the distillate to an empty tank.

19. Shift three-way cock 17 to the position to cut off the tank being filled up.

Drainage of Distillate from Tanks to Distilled or Fresh Water Systems

Depending on the need, the distillate is transferred from the distilled water tanks either to the distilled or fresh water systems with the aid of the compressed air, for which purpose:

20. Prepare the distilled or fresh water systems in accordance with the respective instructions.

21. Set three-way cock 21 to the position to feed air to the tank filled with the distilled water.

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22. Close valve 20 on the tank filled with the distilled water.

23. Open valve 18 or 19 depending on the system to be filled with the distilled water from the tank.

24. By slowly cracking throttle valve 25, feed intermediate pressure air to the tank to be drained through strainer 23 and three-way cock 21; when doing so, watch pressure gauge 24 lest compressed air pressure should exceed 1.0 kgf/cm^2 and drain the tank.

25. If pressure gauge 24 reads drop in pressure, the distilled water tank has been drained.

26. After the second tank has been filled with the distillate, the procedures of Items 22, 23, 24 and 25 shall be repeated.

Washing of Electric Distiller after Protracted Shut-Down Period to Produce Distillate Used for Drinking

The electric distiller shall be washed for twenty minutes or for one hour if the shut-down period equals three or more than three days, respectively.

For washing the electric distiller, do the following:

27. Set three-way cock 9 to the position to drain the distillate to the bilge.

28. After washing the electric distiller during the time indicated above, set three-way cock 9 to the position to feed the distillate through salinometer strainer 10.

Washing of Salinometer Strainer

(See the Salinometer Operating Instructions)

In case the salinometer strainer gets clogged, wash it, for which purpose proceed as follows:

29. Set three-way cock 12 to the position to feed the distillate through strainer 10 only.

30. Set three-way cock 9 to the position to drain water to the bilge from strainer 10 only.

31. After washing strainer 10, set three-way cocks 9 and 12 to the initial positions, i.e. to feed the distillate from the distilling plant to the distilled water tanks.

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Brine Sampling

For sampling the brine from the distilling plant, proceed as follows:

32. Make sure that valve 3 intended for draining the brine from the distilling plant is open.
33. Set three-way cock 4 to the position to drain the brine to the bilge.
34. Draw the brine sample from the pipe running from three-way cock 4 and determine its salinity.

For determination of the brine salinity and the number of the samples to be drawn, proceed in accordance with the Maintenance Instructions for the Distilling Plant .

35. After drawing a sample of the brine, set three-way cock 4 to the initial position, i.e. to drain the brine to the contaminated water tank.

Drainage of Electric Distiller

The electric distilling plant is to be drained in case of repair or in case it is stopped for more than 8 hours. For draining the distilling plant, proceed in accordance with the Maintenance Instructions for the Electric Distilling Plant, and do the following:

36. Make sure that valves 4, 7, 8, 26 and 27 are shut down.
37. Make sure that valve 3 is open.
38. Set three-way cocks 9 and 12 to the positions to communicate all the pipe lines and drain the distillate to the bilge.
39. See to it that three-way cock 6 is in the position to drain the brine to the contaminated water tank.
40. Make sure that valve 5 is open.
41. Completion of the brine draining to the contaminated water tank is determined by shifting three-way cock 6 to drain the brine to the bilge for a short period of time.
42. Make sure that valve 1 and straight-way cock 35 are open and watch the housing of the distiller being drained. Use the inspection glass for this purpose.

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43. Make sure that straight-way steam is open and watch the distiller being drained by the gauge glass mounted on it.

Draining of Distillate from Tanks to Bilge

The distillate is to be drained from the tanks to the bilge when it does not answer the purpose. To drain the distillate to the bilge, proceed as follows:

- 44. Open valve 20 on the tank to be drained.
- 45. Open valve 15 on the tank to be drained and check to see that water is drained.

D. MAINTENANCE DURING PROTRACTED SHUT-DOWN PERIOD

46. Drain water from the pipe lines through the drain valves and by disassembling the joints arranged in low points and blow them with dried purified air, after which reassemble the joints.

47. Inspect and repair the fittings, if necessary, clean, slush and install them in their proper places. Replace the gaskets and gland packing, if necessary. For slushing use the gun grease.

48. Restore painting where required using the standard paints.

For activation of the system do the following:

49. Remove the slush from the fittings and from the outer parts of the pipe line attachments by wiping them with rags soaked in kerosene.

Work out the valves and the drives; eliminate troubles, if any. Inspect and repair the safety valves, adjust them and seal.

50. Blow off the water pipe lines with air and pump water through them. Blow off the air pipe lines with air.

51. Check the water and the air pipe lines for air tightness. Do it in accordance with the instructions given in Table 2.

52. Check the glands for condition, tighten up or replace gland packing, if necessary.

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53. Restore painting of the pipe lines and fittings, if necessary, using the standard paints.

54. Check the system in operation, proceeding in accordance with the respective instructions.

Control Instruments

55. Perform an external inspection of the control instruments.

The instruments with corroded or damaged parts shall be replaced.

56. Work out the valves of the control instruments.

57. The instruments whose term of checking has elapsed shall be checked, the other instruments shall be checked in their places with the aid of the test gauges.

58. When checking the system in operation, check the instruments for operation and for correct readings.

Carry out the following inspections and procedures with the system under preservation:

Monthly Inspection

59. Perform an external inspection of the fittings and of the pipe lines to make sure that the preservative is present on them.

60. Make sure that no water is present in the pipe lines, otherwise drain it.

Inspection To Be Carried Out Once In Three Years

61. Perform the procedures outlined under Items 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, after which reslush the system.

E. TROUBLES AND REMEDIES

When eliminating the trouble which involves disassembly of the pipe line, water shall be drained from the respective sections of the pipe lines.

For the troubles and remedies see Table 3.

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Table 2

No.	Trouble	Cause	Remedies
1	Gland packings of valves and cocks leaky	Nuts tightening bushes of gland packings loose	Tighten up nuts of glands. Replace gland packing
2	Valves untight	Uneven wear or damage of disc or seat contact surfaces	Lap valve discs
3	(a) Flanged joints untight	Nuts loose; thread of bolts or nuts damaged; gasket torn	Tighten up nuts, replace nuts, bolts or studs; replace gasket
	(b) Pipe unions untight	Gasket torn; nuts loose	Replace gaskets, tighten up nuts
4	Pressure after reducing valve above 2.5 kgf/cm ²	(a) Adjusting spring slack	Close valve 26 or 27. Adjust pressure with the help of adjusting bush
		(b) Diaphragm torn	Close valve 26 or 27, disassemble reducing valve, replace diaphragm

After repairing leaky pipe lines, test them for tightness according to Table 2.

F. PREVENTIVE INSPECTIONS AND MAINTENANCE

Daily Inspection

62. Perform an external inspection and clean the pipe lines, fittings and the control instruments of the distilling plant.

63. Check all the valves and cocks; work them out, if necessary. Check operation of the reducing valve by the pressure

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gauge readings. Make sure that the pipes are connected correctly and the valves are in the positions required.

Weekly Inspection

Perform the procedures for the daily inspection and besides:

64. Check the safety valves for proper operation by raising pressure to pop them.

Monthly Inspection

Perform all the procedures for daily and weekly inspections and besides:

65. Check the flanged and union joints of the pipe lines. Eliminate leaky joints by tightening them and replacing the gaskets, if necessary.

66. Check the gland packings of the stems of the valves and cocks. Tighten up or replace the gland packing, if necessary.

67. Open and clean the filtering element of the sea water strum.

68. After a month of continuous operation of the air strainer, wash it with the solution of calcium hypochlorite.

Inspection during Running Repair

Perform all the procedures of daily, weekly and monthly inspections and besides:

69. Inspect, adjust and seal the safety valves. Inspect and repair shut-off valves and cocks, if necessary.

70. Test the pipe line for tightness according to Table 2.

G. REFERENCE DATA

The weight of the electric distilling plant when in use is approximately equal to 695 kg.

Capacity:

(a) at the compressor speed of 1400 to 1450 r.p.m. - not less than 25 lit/hr;

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(b) at the compressor speed of 1900 to 2000 r.p.m. - not less than 45 lit/hr.

Salinity of the distillate is not in excess of 5 mg/lit.

Salinity of the feed water is 50 to 300 mg/lit.

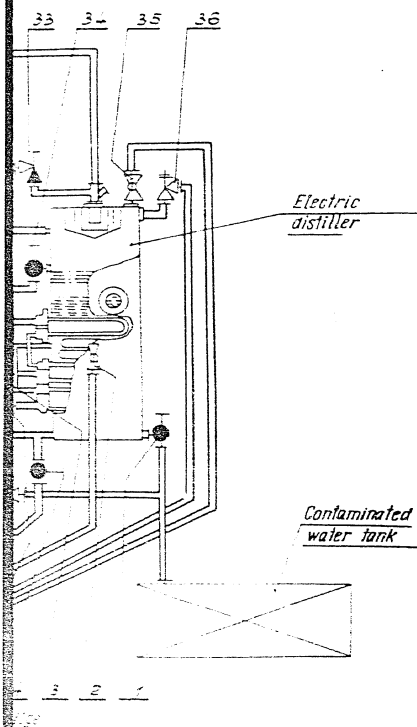
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Appendix I



Plain pipe line	
Air pipe line	
Distilled water pipe line	
Strainer pipe line	
Sea water pipe line	
Sea water strum	
Air strainer	
Salinometer strainer	
Millivoltmeter-salinometer	
Compound pressure and vacuum gauge	
Pressure gauge	
Angle non-return shut-off valve	
Safety valve	
Pressure gauge valve	
Safety valve without drain	
Throttle valve	
Straight-way cock	
Three-way cock with L-shaped plug	
Salinometer pick-up	
Three-way cock with T-shaped plug	
Reducing valve	
Straight-way shut-off valve	
Angle shut-off valve	
Description	Symbols

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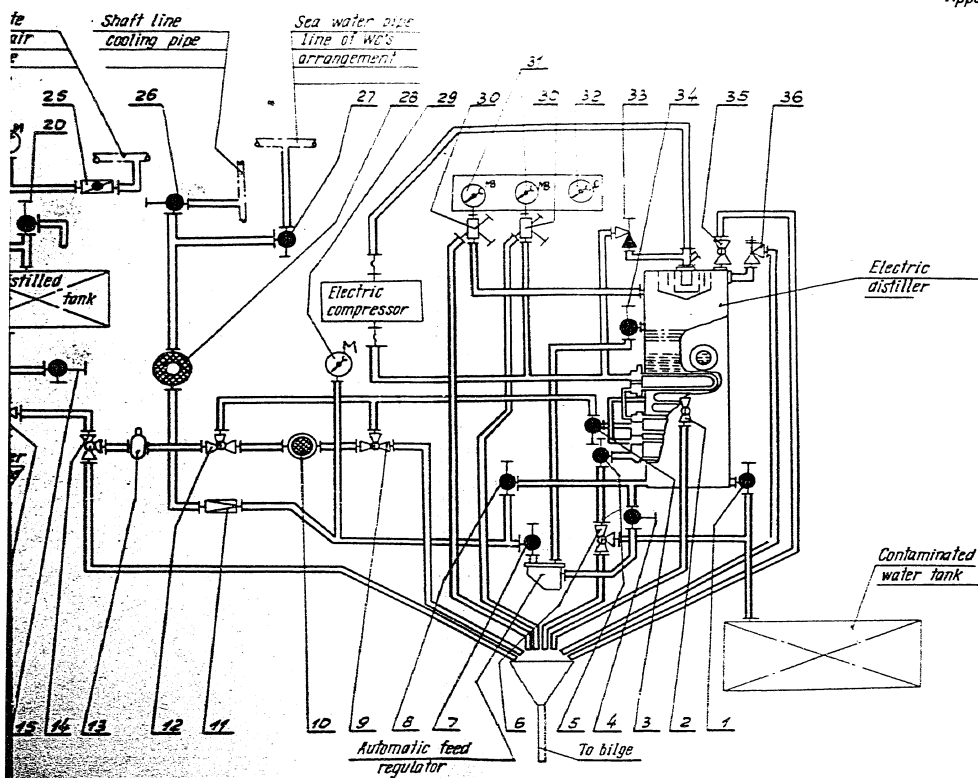
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Electric Distilling Plant Pipe Lines Arrangement

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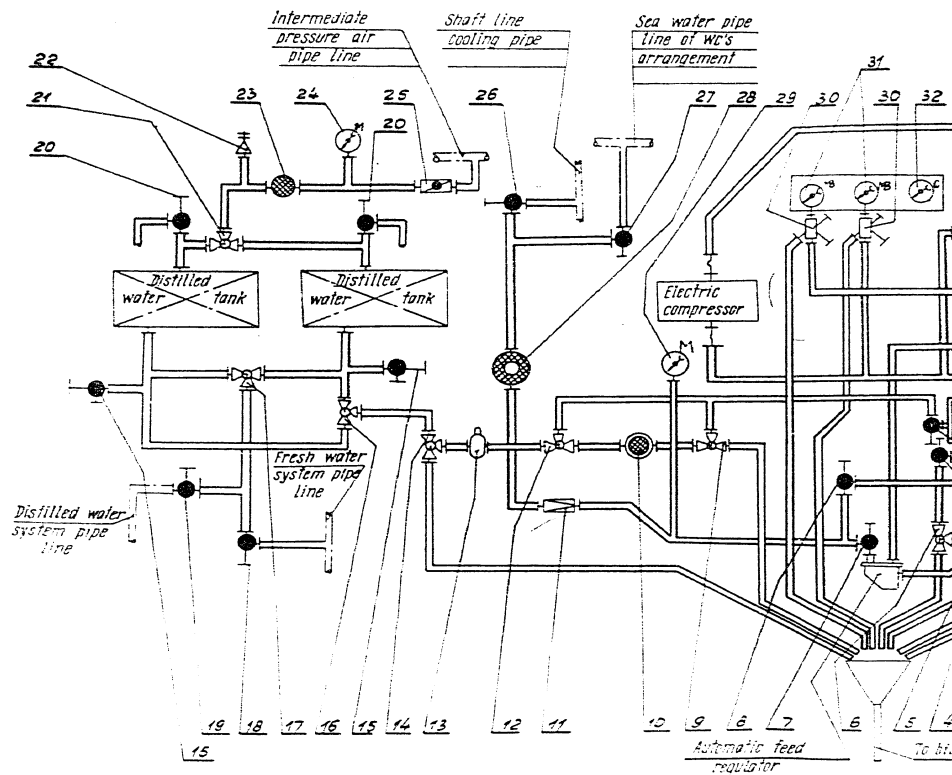


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Electric Distilling Plant Pipe Lines Arrangement

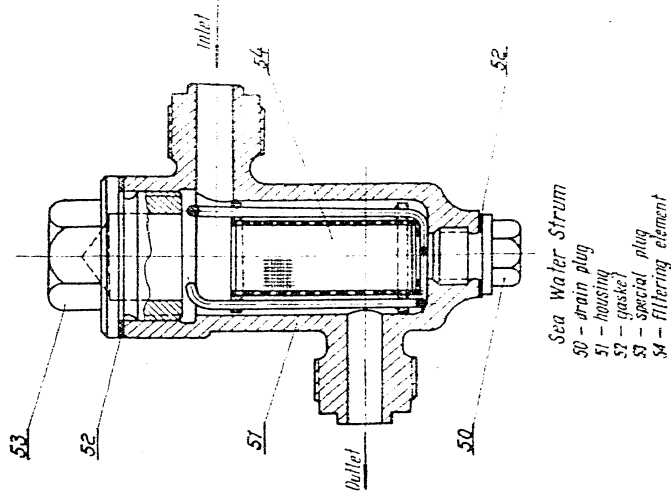
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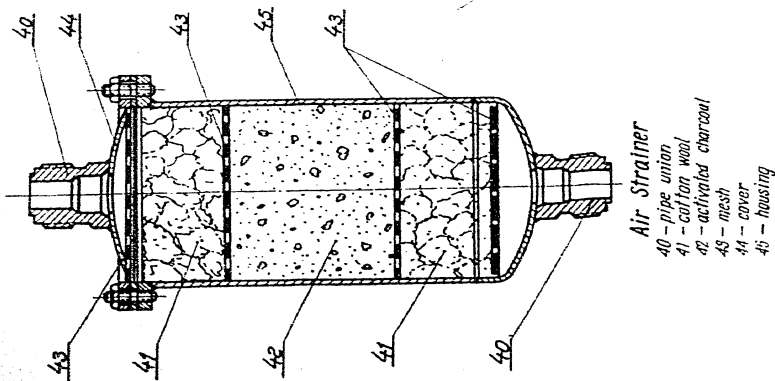
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Appendix 3



Appendix 2



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